

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1. (Previously Presented) An image display apparatus comprising:

a plurality of display pixels arranged in a matrix to provide image display, each of said display pixels comprising a pixel electrode and a pixel switch connected to said pixel electrode in series;

a plurality of memory elements for storing digital display data;

image signal generating means for outputting a given image signal based on said digital display data;

a group of signal lines for connecting said image signal generating means to a group of pixel switches; and

display image selection means for writing said image signal in a given display pixel through said group of signal lines and a group of pixel switches,

wherein each basic unit of a memory element comprises a memory switch; a memory capacitor connected to said memory switch; an amplifier field-effect transistor (FET) of which a gate is connected to said memory capacitor; and refreshing operation means for performing a preset refreshing operation to rewrite a signal charge stored in said memory capacitor using said amplifier FET.

2. (Original) An image display apparatus according to claim 1, wherein each of said plurality of display pixels is a liquid crystal display pixel having a counter electrode and a liquid crystal region between said pixel electrode and said counter electrode.

3. (Original) An image display apparatus according to claim 2, wherein said plurality of display pixels have an optical reflecting plate.

4. (Original) An image display apparatus according to claim 1, wherein said plurality of display pixels, said group of signal lines and said image signal generating means are formed on a single transparent substrate.

5. (Original) An image display apparatus according to claim 1, wherein said pixel switch is a thin-film transistor (TFT).

6. (Original) An image display apparatus according to claim 5, wherein said pixel switch is a polycrystalline Si thin-film transistor (poly-Si TFT).

7. (Original) An image display apparatus according to claim 6, wherein said memory switch is a polycrystalline Si thin-film transistor (poly-Si TFT).

8. (Previously Presented) An image display apparatus according to claim 6, wherein said amplifier FET is a polycrystalline Si thin-film transistor (poly-Si TFT).

9. (Original) An image display apparatus according to claim 1, wherein said memory capacitor is a capacitor between a gate and a channel of said amplifier FET.

10. (Previously Presented) An image display apparatus according to claim 6, wherein said memory capacitor is a capacitor between a gate and a channel of a polycrystalline Si thin-film transistor (poly-Si TFT).

11. (Previously Presented) An image display apparatus according to claim 1, wherein said memory capacitor is further connected to a wire to which a preset voltage is applied.

12. (Previously Presented) An image display apparatus according to claim 1, wherein said memory capacitor is further connected to an indium tin oxide (ITO) thin film to which a preset voltage is applied.

13. (Previously Presented) An image display apparatus according to claim 1, wherein said memory capacitor is further connected to a source of said amplifier FET.

14. (Previously Presented) An image display apparatus according to claim 1, wherein said memory capacitor is further connected to a drain of said amplifier FET.

15. (Previously Presented) An image display apparatus according to claim 1, wherein a drain of said amplifier FET is connected to voltage applying means.

16. (Previously Presented) An image display apparatus according to claim 1, wherein a source of said amplifier FET is connected to voltage applying means.

17. (Previously Presented) An image display apparatus according to claim 1, wherein a plurality of basic units of said memory elements are connected to

one another by a data line, and said amplifier FET is connected to said data line through a selection switch.

18. (Original) An image display apparatus according to claim 17, wherein said selection switch is a polycrystalline Si thin-film transistor (poly-Si TFT).

19. (Previously Presented) An image display apparatus according to claim 18, wherein said selection switch is a polycrystalline Si thin-film transistor (poly-Si TFT) which is diode-connected in which the drain and the gate thereof are directly coupled.

20. (Original) An image display apparatus according to claim 17, wherein said selection switch is a p-n junction diode using a polycrystalline Si thin film.

21. (Original) An image display apparatus according to claim 17, wherein said basic units of the memory elements are arranged in a matrix along a group of data lines extending in a y-direction, and said memory switch and said selection switch in the individual basic unit are connected to the same data line.

22. (Original) An image display apparatus according to claim 17, wherein said basic units of the memory elements are arranged in a matrix along a group of data lines extending in a y-direction, and said memory switch and said selection switch in the individual basic unit are connected to the data lines different from each other.

23. (Previously Presented) An image display apparatus according to claim 17, wherein said basic units of the memory elements are arranged in a matrix along a group of data lines extending in a y-direction, and said data lines are arranged by n line units in a case where unit digital display data composed of n bits is stored by n basic units of said memory elements.

24. (Previously Presented) An image display apparatus according to claim 4, wherein lighting means to the display pixels is provided on a surface of said transparent substrate opposite to the surface on which the display pixels, the group of signal lines and the image signal generating means are arranged, and black matrix shielding means is arranged between said transparent substrate corresponding to back portions of said memory elements and said lighting means.

25. (Original) An image display apparatus according to claim 17, wherein a gate of complementary metal-oxide-semiconductor (CMOS) inverter is connected to said data line.

26. (Previously Presented) An image display apparatus according to claim 1, wherein said image signal generating means has digital-to-analog converting means for generating an image signal from display data stored in said memory element.

27. (Previously Presented) An image display apparatus according to claim 2, wherein said image signal generating means has digital-to-analog converting means for generating an image signal from said digital display data stored in said memory element, and said digital-to-analog converting means has a function of

selectively outputting substantially two kinds of image signal voltages to the same digital display data.

28. (Currently Amended) An image display apparatus comprising:
a plurality of display pixels arranged in a matrix in order to provide image display, each display pixel ~~comprises~~ comprising a pixel electrode and a pixel switch connected to said pixel electrode in series;
image signal generating means for outputting an image signal based on digital display data;
a group of signal lines for connecting said image signal generating means to a group of pixel switches; and
display image selection means for writing said image signal in a given display pixel through said group of signal lines and said group of pixel switches, at least said plurality of display pixels, said group of signal lines and said image signal generating means being formed on a single transparent substrate,
wherein said image signal generating means has a reference voltage generating circuit using a boron-doped polycrystalline Si (poly-Si) thin-film resistor as a gray scale voltage generating resistor.

29. (Currently Amended) A method of driving an image display apparatus, said image display apparatus comprising:
a plurality of display pixels arranged in a matrix in order to provide image display, each display pixel comprising a pixel electrode and a pixel switch connected to said pixel electrode in series;

image signal generating means for outputting an image signal based on digital display data, said image signal generating means having a plurality of memory elements for storing said digital display data;

a group of signal lines for connecting said image signal generating means to a group of pixel switches; and

display image selection means for writing said image signal in a given display pixel through said group of signal lines and said group of pixel switches,

wherein each basic unit of a memory element comprises a memory switch; a memory capacitor connected to said memory switch; and refreshing operation means for performing a preset refreshing operation to rewrite a signal charge stored in said memory capacitor, and

wherein reading of said digital display data from said memory element is included in a refreshing operation to said memory element using said refreshing operation means.

30. (Previously Presented) A method of driving an image display apparatus according to claim 29, wherein the reading operation of the display data from said memory element is substantially equal to the refreshing operation to said memory element using said refreshing operation means.

31. (Previously Presented): A method of driving an image display apparatus, said image display apparatus comprising:

a plurality of display pixels arranged in a matrix in order to provide image display, each display pixel comprising a pixel electrode and a pixel switch connected to said pixel electrode in series;

image signal generating means for outputting an image signal based on digital display data, said image signal generating means having a plurality of memory elements for storing said digital display data;

a group of signal lines for connecting said image signal generating means to a group of pixel switches; and

display image selection means for writing said image signal in a given display pixel through said group of signal lines and said group of pixel switches,

wherein each basic unit of a memory element comprises a memory switch; a memory capacitor connected to said memory switch; and refreshing operation means for performing a preset refreshing operation to rewrite a signal charge stored in said memory capacitor, and

wherein writing of said digital display data to said memory element is performed based on address data, and refreshing to said memory element using said refreshing operation means is performed by sequentially scanning.

32. (Previously Presented) A method of driving an image display apparatus, said image display apparatus comprising:

a plurality of display pixels arranged in a matrix in order to provide image display, each display pixel comprising a pixel electrode and a pixel switch connected to said pixel electrode in series;

image signal generating means for outputting an image signal based on digital display data, said image signal generating means having a plurality of memory elements for storing said digital display data;

a group of signal lines for connecting said image signal generating means to a group of pixel switches; and

display image selection means for writing said image signal in a given display pixel through said group of signal lines and said group of pixel switches,

wherein each basic unit of a memory element comprises a memory switch; a memory capacitor connected to said memory switch; and refreshing operation means for performing a preset refreshing operation to rewrite a signal charge stored in said memory capacitor,

wherein a plural number of said memory elements are connected to a common data line, and

wherein the refreshing to said memory element using said refreshing operation means is performed by initially outputting said digital display data to said data line; further amplifying a voltage level of said display data written in said data line; and then rewriting the amplified voltage of said digital display data from said data line.

33. (Previously Presented) A method of driving an image display apparatus, said image display apparatus comprising:

a plurality of display pixels arranged in a matrix in order to provide image display, each display pixel comprising a pixel electrode and a pixel switch connected to said pixel electrode in series;

image signal generating means for outputting an image signal based on digital display data, said image signal generating means having a plurality of memory elements for storing said digital display data;

a group of signal lines for connecting said image signal generating means to a group of pixel switches; and

display image selection means for writing said image signal in a given display pixel through said group of signal lines and said group of pixel switches,

wherein each basic unit of a memory element comprises a memory switch; a memory capacitor connected to said memory switch; and refreshing operation means for performing a preset refreshing operation to rewrite a signal charge stored in said memory capacitor,

wherein a plural number of said memory elements are connected to a common data line, and

wherein the refreshing to said memory element using said refreshing operation means is performed by initially outputting said digital display data to said data line; and directly rewriting the voltage of said digital display data from said data line.

34. (Previously Presented) A method of driving an image display apparatus according to claim 32 or claim 33, wherein the writing of said digital display data to said memory element is performed by address data.

35. (Previously Presented) A method of driving an image display apparatus, said image display apparatus comprising:

a plurality of display pixels arranged in a matrix in order to provide image display, each display pixel comprising a pixel electrode and a pixel switch connected to said pixel electrode in series;

image signal generating means for outputting an image signal based on digital display data, said image signal generating means having a plurality of memory elements for storing said digital display data;

a group of signal lines for connecting said image signal generating means to a group of pixel switches; and

display image selection means for writing said image signal in a given display pixel through said group of signal lines and said group of pixel switches,

wherein each basic unit of a memory element comprises a memory switch; a memory capacitor connected to said memory switch; and refreshing operation means for performing a preset refreshing operation to rewrite a signal charge stored in said memory capacitor, and

wherein a driving pulse for driving said display image selection means and a driving pulse for driving said refreshing operation means are the same driving pulse branched from a single input.

36. (Previously Presented): A method of driving an image display apparatus, said image display apparatus comprising:

a plurality of display pixels arranged in a matrix in order to provide image display, each display pixel comprising a pixel electrode and a pixel switch connected to said pixel electrode in series;

image signal generating means for outputting an image signal based on digital display data, said image signal generating means having a plurality of memory elements for storing said digital display data;

a group of signal lines for connecting said image signal generating means to a group of pixel switches; and

display image selection means for writing said image signal in a given display pixel through said group of signal lines and said group of pixel switches,

wherein each basic unit of a memory element comprises a memory switch; a memory capacitor connected to said memory switch; an amplifier field-effect transistor (FET) of which a gate is connected to said memory capacitor; and

refreshing operation means for performing a preset refreshing operation to rewrite a signal charge stored in said memory capacitor using said amplifier FET, and

wherein a read-out pulse is applied to a drain of said amplifier FET, when said digital display data is read out of said memory element.

37. (Previously Presented) A method of driving an image display apparatus, said image display apparatus comprising:

a plurality of display pixels arranged in a matrix in order to provide image display, each display pixel comprising a pixel electrode and a pixel switch connected to said pixel electrode in series;

image signal generating means for outputting an image signal based on digital display data, said image signal generating means having a plurality of memory elements for storing said digital display data;

a group of signal lines for connecting said image signal generating means to a group of pixel switches; and

display image selection means for writing said image signal in a given display pixel through said group of signal lines and said group of pixel switches,

wherein each basic unit of a memory element comprises a memory switch; a memory capacitor connected to said memory switch; an amplifier field-effect transistor (FET) of which a gate is connected to said memory capacitor; and refreshing operation means for performing a preset refreshing operation to rewrite a signal charge stored in said memory capacitor using said amplifier FET, and

wherein a read-out pulse is applied to a source of said amplifier FET, when said digital display data is read out of said memory element.

38. (Previously Presented) A method of driving an image display apparatus according to claim 35 or claim 37, wherein an amplitude of voltage driving said memory switch is larger than an amplitude of read-out pulse voltage applied to the drain or the source of said amplifier FET.

39. (Previously Presented) An image display apparatus comprising:

- a plurality of display pixels arranged in a matrix to provide image display, each of said display pixels comprising a pixel electrode and a pixel switch connected to said pixel electrode in series;
- a plurality of multi-bit memory elements for storing digital display data;
- image signal generating means for outputting a given image signal based on said digital display data;
- a group of signal lines for connecting said image signal generating means to a group of pixel switches; and
- display image selection means for writing said image signal in a given display pixel through said group of signal lines and a group of pixel switches,

wherein a basic unit of each of said multi-bit memory elements comprises a memory switch; a memory capacitor connected to said memory switch; an amplifier field-effect transistor (FET) of which a gate is connected to said memory capacitor; and refreshing operation means for performing a preset refreshing operation to rewrite a signal charge stored in said memory capacitor using said amplifier FET.